MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

HMB2011 – INTRODUCTION TO MOLECULAR BIOLOGY

(All section / Groups)

11 OCTOBER 2017
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **4** printed pages including the cover page with **5** questions only.
2. Attempt all **FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the **Answer Booklet** provided.

QUESTION 1

a. i) Using the *trp* operon as an example, explain how the attenuation process operates by causing premature termination of transcription. Illustrate your answer with a simple diagram.

[3.5 marks]

ii) Briefly explain the role of cyclic AMP (cAMP) in the synthesis of β-galactosidase.

[2 marks]

b. Define the fidelity of DNA polymerase in PCR.

[2 marks]

c. Describe the cascade of events responsible for the sudden changes in gene expression in a bacterial cell following the additional of lactose. How does this compare with the events that occur in response to additional of tryptophan?

[2.5 marks]

QUESTION 2

a. i) Chromatin remodeling is essential for gene activation and can be achieved using different mechanisms. Distinguish different types of enzymes that are used to modify histones, and how do these enzymatic modifications lead to chromatin remodeling?

[3 marks]

ii) Distinguish the difference between a transcriptional activator and transcriptional repressor in eukaryotes.

[2 marks]

b. i) Researcher employs nucleic acid extraction for the gene expression study. Specify the function for each component used in phenol/chloroform purification during the DNA extraction.

[2 marks]

ii) Agarose gel electrophoresis is a method used to perform quantitative and qualitative analysis of nucleic acid. Name any two techniques to recover the DNA from agarose gel.

[1 mark]

Continued...

c. A geneticist discovers that two different proteins are encoded by the same gene. One protein has 56 amino acids and the other 82 amino acids. Provide one of the possible explanations on how the same gene could encode both of these proteins.

[2 marks]

QUESTION 3

a. i) Homologous recombination is required for chromosome segregation during meiosis. With the aid of diagram, explain homologous recombinant process in eukaryote.

[4 marks]

ii) Identify the biological roles of site-specific recombination.

[1.5 marks]

b. Researcher wants to measure repetitively the hot metal using electronic balance. What are the procedures he/she must follow while using electronic balance?

[1.5 marks]

c. What is the connection between BRCA2, genome stability and cancer?

[3 marks]

QUESTION 4

a. Briefly describe the following types of DNA repair mechanisms.
   i) Translesion synthesis
   ii) Photoreactivation

[2 marks]

iii) How does lambda repressor shut down phage gene expression?

[1 mark]

b. i) Describe two ethical concern related to recombinant DNA technology.

[1 mark]

ii) Another system for recombinant selection is by the use of blue/white screening method. Explain the rationale of the method with the help of a simple diagram.

[3 marks]

Continued...

c. Describe the Southern blotting procedure and explain how it can be used to detect and analyze restriction fragment length polymorphism (RFLP).

[3 marks]

QUESTION 5

a. i) Damaged DNA can increase the risk of cancer. Describe two consequences of DNA damage.

[2 marks]

ii) Briefly explain, three health consequences of inherited mutations in repair pathway proteins?

[3 marks]

b. i) What is cDNA library? What makes cDNA library different from genomic library?

[2 marks]

ii) What is solid phase amplification?

[1 mark]

c. You want to amplify the DNA between the two stretches of sequence shown below. Design a pair of primers that may allow you to amplify the DNA by PCR solely based on the given sequence.

DNA to be amplified
5'- GATCTGTGCAAGTTGCAG----------CATATGGACCTTGACATG-3'

[2 marks]

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